

[Document Name] Scope of Claims

[Claim 1]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and

specifying a communication range of at least one of the two radio stations to determine the candidate point included in the communication range of the two candidate points as the geographical location of the radio terminal.

[Claim 2]

The terminal location specification method according to claim 1, wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio

station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are determined as said two candidate points.

[Claim 3]

The terminal location specification method according to claim 1, wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said radio terminal.

[Claim 4]

The terminal location specification method according to claim 1, wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 5]

The terminal location specification method according to claim 1, wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 6]

The terminal location specification method according to claim 1, wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 7]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different, and the radio terminal, the geographical location of which is unknown, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and

specifying a arrival direction of the signal from the radio terminal received in a first radio station to compare the direction of a straight line connecting each of the two candidate points and the first radio station with the arrival direction to determine the candidate point in which the arrival direction corresponds with the direction of the

straight line as the geographical location of the radio terminal.

[Claim 8]

The terminal location specification method according to claim 7, wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are determined as said two candidate points.

[Claim 9]

The terminal location specification method according to claim 7, wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a

difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said radio terminal.

[Claim 10]

The terminal location specification method according to claim 7, wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 11]

The terminal location specification method according to claim 7, wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 12]

The terminal location specification method according to claim 7, wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 13]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different, and the radio

terminal, the geographical location of which is unknown, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and

specifying arrival directions of the signals received by the radio terminal from each of the two radio stations as arrival angles to calculate angles which a straight line connecting the candidate points and one of the two radio stations forms with a straight line connecting the candidate points and the other of said two radio stations for each of the candidate points as candidate angles to compare a difference of the arrival angles with each of the candidate angles to determine the candidate point having the candidate angle which corresponds with the difference of the arrival angles as the geographical location of the radio terminal.

[Claim 14]

The terminal location specification method according to claim 13,

wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio

station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are determined as said two candidate points.

[Claim 15]

The terminal location specification method according to claim 13,

wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said radio terminal.

[Claim 16]

The terminal location specification method according to claim 13,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges

conduct radio communication, said two radio stations are the base stations.

[Claim 17]

The terminal location specification method according to claim 1, wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 18]

The terminal location specification method according to claim 13,

wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 19]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio



signals between the two radio stations and the radio terminal; and

measuring the electric field intensity of the signal received by the radio terminal from one of the two radio stations to compare this electric field intensity with received electric field intensity information which is kept in any one of the apparatus, the base stations, and the terminal, and in which the electric field intensity of the signals from the radio stations measured in a plurality of measurement points in communication ranges of the radio stations is related to the geographical location of the measurement points to specify the geographical location of the measurement points related to a value close to the electric field intensity to determine the candidate point close to the specified geographical location of the measurement points as the geographical location of the radio terminal.

[Claim 20]

The terminal location specification method according to claim 19,

wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the

second distance are determined as said two candidate points.

[Claim 21]

The terminal location specification method according to claim 19,

wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said radio terminal.

[Claim 22]

The terminal location specification method according to claim 19,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 23]

The terminal location specification method according to claim 19,

wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 24]

The terminal location specification method according to claim 19,

wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 25]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network, the terminal location specification method comprising the steps of:

depicting two curves to estimate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and

measuring the propagation condition of the signal received by the radio terminal from one of the two radio stations to compare this propagation condition with propagation condition information which is kept in any one of the apparatus, the base stations, and the radio terminal, and in which the propagation conditions of the signals from the radio stations measured in a plurality of measurement points in communication ranges of the radio stations are related to the geographical location of the measurement points to specify the geographical location of the measurement points having a propagation condition close to the propagation condition measured by the radio terminal to determine the candidate point close to the specified geographical location of the measurement points as the geographical location of the radio terminal.

[Claim 26]

The terminal location specification method according to claim 25,

wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the

second distance are determined as said two candidate points.

[Claim 27]

The terminal location specification method according to claim 25,

wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said radio terminal.

[Claim 28]

The terminal location specification method according to claim 25,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 29]

The terminal location specification method according to claim 25,

wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 30]

The terminal location specification method according to claim 25,

wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 31]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal having a function to measure geomagnetism, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio

signals between the two radio stations and the radio terminal; and

comparing the geomagnetism measured by the radio terminal with geomagnetism information which is kept in any one of the apparatus, the base stations, and the radio terminal, and in which geomagnetism measured in a plurality of measurement points in communication ranges of the radio stations is related to the geographical location of the measurement points to specify the geographical location of the measurement points related to the value of geomagnetism close to the geomagnetism to determine the candidate point close to the specified geographical location of the measurement points as the geographical location of the radio terminal.

[Claim 32]

The terminal location specification method according to claim 31,

wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are determined as said two candidate points.

[Claim 33]

The terminal location specification method according to claim 31,

wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said radio terminal.

[Claim 34]

The terminal location specification method according to claim 31,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 35]

The terminal location specification method according to claim



31,

wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 36]

The terminal location specification method according to claim 31,

wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 37]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and

determining, if geographical location of one of the two candidate points is a location in which the radio terminal is not likely to exist, the other candidate point as the geographical location of the radio terminal.

[Claim 38]

The terminal location specification method according to claim

37,

wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are determined as said two candidate points.

[Claim 39]

The terminal location specification method according to claim 37,

wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of

the first distance are determined as said two candidate points for said radio terminal.

[Claim 40]

The terminal location specification method according to claim 37,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 41]

The terminal location specification method according to claim 37,

wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 42]

The terminal location specification method according to claim 37,

wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 43]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception

of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal having a function to measure altitude, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between said two radio stations and said radio terminal; and

comparing the altitude measured by the radio terminal with the altitude information on the candidate points of the altitude information which is kept in any one of the apparatus, the base stations, and the radio terminal, and in which altitude information on points of communication ranges of the radio stations is related to the geographical location to determine the candidate point in which the altitude information close to the measured altitude is kept as the location of the radio terminal.

[Claim 44]

The terminal location specification method according to claim 43,

wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time

between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are determined as said two candidate points.

[Claim 45]

The terminal location specification method according to claim 43,

wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said radio terminal.

[Claim 46]

The terminal location specification method according to claim 43,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 47]

The terminal location specification method according to claim 43,

wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 48]

The terminal location specification method according to claim 43,

wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 49]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are

connected, and other necessary apparatus connected to the fixed network, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and comparing each of the candidate points with positioning history information in which the location of the radio terminal specified by any one of the apparatus, the base stations, and the radio terminal in the past is kept to determine the candidate point close to the location of the radio terminal kept in the positioning history information as the location of the radio terminal.

[Claim 50]

The terminal location specification method according to claim 49,

wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are determined as said two candidate points.

[Claim 51]

The terminal location specification method according to claim 49,

wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said radio terminal.

[Claim 52]

The terminal location specification method according to claim 49,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 53]



The terminal location specification method according to claim 49,

wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 54]

The terminal location specification method according to claim 49,

wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 55]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and a first radio terminal, geographical location of which is unknown, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the first radio terminal; and

conducting communication between the radio terminal and its same radio station to compare geographical location of a second radio terminal, the geographical location of which is known with the candidate points to determine the candidate point close to the geographical

location of the second radio terminal as the geographical location of the first radio terminal.

[Claim 56]

The terminal location specification method according to claim 55,

wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are determined as said two candidate points.

[Claim 57]

The terminal location specification method according to claim 55,

wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two

intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said radio terminal.

[Claim 58]

The terminal location specification method according to claim 55,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 59]

The terminal location specification method according to claim 55,

wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 60]

The terminal location specification method according to claim 55,

wherein said radio terminal has a function to receive a signal

from a GPS satellite, said radio stations being the GPS satellites.

[Claim 61]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal having an imaging function, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the first radio terminal; and

comparing the outward appearance of surrounding buildings photographed by the radio terminal using the imaging function with the outward appearance information of buildings in communication areas of the radio stations, which is kept in any one of the apparatus, the base stations, and the radio terminal to determine the candidate point in which the photographed outward appearance corresponds with the outward appearance information as the location of the radio terminal.

[Claim 62]

The terminal location specification method according to claim 61,

wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are determined as said two candidate points.

[Claim 63]

The terminal location specification method according to claim 61,

wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said

radio terminal.

[Claim 64]

The terminal location specification method according to claim 61,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 65]

The terminal location specification method according to claim 61,

wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 66]

The terminal location specification method according to claim 61,

wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 67]

A terminal location specification method for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is

known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network, the terminal location specification method comprising the steps of:

depicting two curves to determine two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the first radio terminal; and

estimating the effect of a shield due to a building based on the disposition information of buildings in communication ranges of the radio stations, which is kept in any one of the apparatus, the base stations, and the radio terminal to determine, if one of the candidate points cannot receive the signal from at least one the radio station, the other candidate point as the location of the radio terminal.

[Claim 68]

The terminal location specification method according to claim 67,

wherein it is possible to measure the propagation time of the radio signals between said radio stations and said radio terminal in the step of finding two candidate points, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a

first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are determined as said two candidate points.

[Claim 69]

The terminal location specification method according to claim 67,

wherein, when it is possible to measure the propagation time of the radio signal between one of said two radio stations and said radio terminal, it being possible to measure a difference of the propagation time of the radio signals between said radio terminal and said two radio stations in the step of finding two candidate points, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are determined as said two candidate points for said radio terminal.

[Claim 70]

The terminal location specification method according to claim 67,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio



terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 71]

The terminal location specification method according to claim 67,

wherein in said mobile communication network, said radio terminal has a function to receive a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 72]

The terminal location specification method according to claim 67,

wherein said radio terminal has a function to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 73]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown, the terminal location specification system comprising:

a first function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio

terminal; and

a second function block for specifying a communication range of at least one of the two radio stations to determine the candidate point included in the communication range of said two candidate points as the geographical location of the radio terminal.

[Claim 74]

The terminal location specification system according to claim 73,

wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 75]

The terminal location specification system according to claim 73,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation

time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 76]

The terminal location specification system according to claim 73,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 77]

The terminal location specification system according to claim 73,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 78]

The terminal location specification system according to claim 73,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 79]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown, the terminal location specification system comprising:

a first function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and

a second function block for specifying a arrival direction of the signal from the radio terminal received in a first radio station to compare the direction of a straight line connecting each of said two candidate points and the first radio station with the arrival direction to determine the candidate point in which the arrival direction corresponds with the direction of the straight line as the geographical location of the radio terminal.

[Claim 80]

The terminal location specification system according to claim 79,

wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 81]

The terminal location specification system according to claim 79,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points

for said radio terminal.

[Claim 82]

The terminal location specification system according to claim 79,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 83]

The terminal location specification system according to claim 79,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 84]

The terminal location specification system according to claim 79,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 85]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is

known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown, the terminal location specification system comprising:

a first function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and

a second function block for specifying arrival directions of the signals received by the radio terminal from each of the two radio stations as arrival angles to calculate angles which a straight line connecting the candidate points and one of the two radio stations forms with a straight line connecting the candidate points and the other of said two radio stations for each of the candidate points as candidate angles to compare a difference of the arrival angles with each of the candidate angles to determine the candidate point having the candidate angle which corresponds with the difference of the arrival angles as the geographical location of the radio terminal.

[Claim 86]

The terminal location specification system according to claim 85,

wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second

distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 87]

The terminal location specification system according to claim 85,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 88]

The terminal location specification system according to claim 85,

wherein in a mobile communication network comprising at least



one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 89]

The terminal location specification system according to claim 85,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 90]

The terminal location specification system according to claim 85,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 91]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network,

the terminal location specification system comprising:

a storage function block in which received electric field intensity information in which electric field intensity of the signals from the radio stations measured in a plurality of measurement points in communication ranges of the radio stations is related to the geographical location of the measurement points has been stored;

a first function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and

a second function block for measuring the electric field intensity of the signal received by the radio terminal from one of the two radio stations to compare this electric field intensity with said stored, received electric field intensity information to specify the geographical location of the measurement points related to a value close to the electric field intensity to determine the candidate point close to the specified geographical location of the measurement points as the geographical location of the radio terminal.

[Claim 92]

The terminal location specification system according to claim 91,

wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

wherein a first distance is found from the propagation time

between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 93]

The terminal location specification system according to claim 91,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 94]

The terminal location specification system according to claim 91,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 95]

The terminal location specification system according to claim 91,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 96]

The terminal location specification system according to claim 91,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 97]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are

connected, and other necessary apparatus connected to the fixed network, the terminal location specification system comprising:

a first function block for depicting two curves to estimate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal;

a storage function block in which propagation condition information in which propagation conditions of the signals from the radio stations measured in a plurality of measurement points in communication ranges of the radio stations is related to the geographical location of the measurement points has been stored; and a second function block for measuring the propagation condition of the signal received by the radio terminal from one of the two radio stations to compare this propagation condition with said propagation condition information to specify the geographical location of the measurement points having a propagation condition close to the propagation condition measured by the radio terminal to determine the candidate point close to the specified geographical location of the measurement points as the geographical location of the radio terminal.

[Claim 98]

The terminal location specification system according to claim 97,

wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 99]

The terminal location specification system according to claim 97,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 100]

The terminal location specification system according to claim

97,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 101]

The terminal location specification system according to claim 97,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 102]

The terminal location specification system according to claim 97,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 103]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio

terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network, the terminal location specification system comprising:

- a radio terminal having a first function block for measuring geomagnetism;

- a second function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal;

- a storage function block in which geomagnetism information in which geomagnetism measured in a plurality of measurement points in communication ranges of the radio stations is related to the geographical location of the measurement points has been stored; and

- a third function block for comparing the geomagnetism measured by the radio terminal with said geomagnetism information to specify the geographical location of the measurement points related to the value of geomagnetism close to the geomagnetism to determine the candidate point close to the specified geographical location of the measurement points as the geographical location of the radio terminal.

[Claim 104]

The terminal location specification system according to claim 103,

wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and



wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 105]

The terminal location specification system according to claim 103,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 106]

The terminal location specification system according to claim

103,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 107]

The terminal location specification system according to claim 102,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 108]

The terminal location specification system according to claim 103,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 109]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown, the terminal location specification system comprising:

a first function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and

a second function block for determining, if geographical location of one of the two candidate points is a location in which the radio terminal is not likely to exist, the other candidate point as the geographical location of the radio terminal.

[Claim 110]

The terminal location specification system according to claim 109,

wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 111]

The terminal location specification system according to claim 109,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 112]

The terminal location specification system according to claim 109,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 113]

The terminal location specification system according to claim 109,

wherein in said mobile communication network, said radio

terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 114]

The terminal location specification system according to claim 109,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 115]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network, the terminal location specification system comprising:

a radio terminal having a first function block for measuring altitude;

a storage function block in which altitude information in which altitude information on points of communication ranges of the radio stations is related to the geographical location has been stored;

a second function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the terminal by the use of propagation time

of radio signals between said two radio stations and said radio terminal;  
and

a third function block for comparing the altitude measured by the radio terminal with the altitude information on the candidate points of said altitude information to determine the candidate point in which the altitude information close to the measured altitude is kept as the location of the radio terminal.

[Claim 116]

The terminal location specification system according to claim 115,

wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 117]

The terminal location specification system according to claim 115,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the

radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 118]

The terminal location specification system according to claim 115,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 119]

The terminal location specification system according to claim 115,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations

being the GPS satellite.

[Claim 120]

The terminal location specification system according to claim 115,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 121]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network, the terminal location specification system comprising:

a storage function block in which positioning history information in which the location of the radio terminal specified by any one of the apparatus, the base stations, and the radio terminal specified in the past is kept has been stored;

a first function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the radio terminal; and

a second function block for comparing each of the candidate



points with said positioning history information to determine the candidate point close to the location of the radio terminal kept in said positioning history information as the location of the radio terminal.

[Claim 122]

The terminal location specification system according to claim 121,

wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 123]

The terminal location specification system according to claim 121,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference

of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 124]

The terminal location specification system according to claim 121,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 125]

The terminal location specification system according to claim 121,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 126]

The terminal location specification system according to claim 121,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 127]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and a first radio terminal, geographical location of which is unknown, comprising:

a first function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the first radio terminal; and

a second function block for conducting communication between the radio terminal and its same radio station to compare geographical location of a second radio terminal, the geographical location of which is known with the candidate points to determine the candidate point close to the geographical location of the second radio terminal as the geographical location of the first radio terminal.

[Claim 128]

The terminal location specification system according to claim 127,

wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

wherein a first distance is found from the propagation time

between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 129]

The terminal location specification system according to claim 127,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 130]

The terminal location specification system according to claim 127,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 131]

The terminal location specification system according to claim 127,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 132]

The terminal location specification system according to claim 127,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 133]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are

connected, and other necessary apparatus connected to the fixed network, the terminal location specification system comprising:

- a radio terminal having imaging means;

- a storage function block in which outward appearance information of buildings in communication areas of the radio stations has been stored in relation to the geographical location thereof;

- a first function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the first radio terminal; and

- a second function block for comparing the outward appearance of the buildings photographed by the imaging means of the radio terminal with outward appearance information related to the candidate points of said outward appearance information to determine the candidate point in which said photographed outward appearance corresponds with said outward appearance information as the location of the radio terminal.

[Claim 134]

The terminal location specification system according to claim 133,

- wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

- wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second

distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 135]

The terminal location specification system according to claim 133,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 136]

The terminal location specification system according to claim 133,

wherein in a mobile communication network comprising at least

one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 137]

The terminal location specification system according to claim 133,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 138]

The terminal location specification system according to claim 133,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.

[Claim 139]

A terminal location specification system for specifying geographical location of a radio terminal by transmission and reception of signals between two radio stations, geographical location of which is known and the geographical location of which is different and the radio terminal, the geographical location of which is unknown in a mobile communication network composed of a fixed network to which the radio terminal, the radio stations, and at least one of the radio stations are connected, and other necessary apparatus connected to the fixed network,



the terminal location specification system comprising:

- a storage function block in which disposition information of buildings in communication ranges of the radio stations has been stored;

- a first function block for depicting two curves to calculate two intersection points between the two curves as two candidate points for the geographical location of the radio terminal by the use of propagation time of radio signals between the two radio stations and the first radio terminal; and

- a second function block for estimating the effect of a shield of a building based on said disposition information to determine, if one of the candidate points cannot receive the signal from at least one the radio station, the other candidate point as the location of the radio terminal.

[Claim 140]

The terminal location specification system according to claim 139,

- wherein a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signals between said radio stations and said radio terminal, and

- wherein a first distance is found from the propagation time between a first said radio station and said radio terminal, a second distance is found from the propagation time between a second said radio station and said radio terminal, and two intersection points between a first circle centering on geographical location of the first said radio station with a radius as the first distance, and a second circle centering on geographical location of the second said radio station with a radius as the second distance are calculated as said two candidate points.

[Claim 141]

The terminal location specification system according to claim 139,

wherein, when a function block for calculating said two candidate points is capable of measuring the propagation time of the radio signal between one of said two radio stations and said radio terminal, and is capable of measuring a difference of the propagation time of the radio signals between said radio terminal and said two radio stations, a first distance is found from the propagation time, a difference of the first distance calculated from the difference of the propagation time is found, and two intersection points between a first circle centering on geographical location of the first said radio station having measured the propagation time with a radius as the first distance, and a hyperbola in which a difference of distances from said two radio stations is the difference of the first distance are calculated as said two candidate points for said radio terminal.

[Claim 142]

The terminal location specification system according to claim 139,

wherein in a mobile communication network comprising at least one said radio terminal and at least two base stations, in which one the base station forms a plurality of communication ranges, and said radio terminal and the base stations existing in the communication ranges conduct radio communication, said two radio stations are the base stations.

[Claim 143]

The terminal location specification system according to claim 139,

wherein in said mobile communication network, said radio terminal has means for receiving a signal from a GPS satellite, and one of said radio stations is said base station, the other of said radio stations being the GPS satellite.

[Claim 144]

The terminal location specification system according to claim 139,

wherein said radio terminal has a function block to receive a signal from a GPS satellite, said radio stations being the GPS satellites.